

SILICON Emitter WITH LOW POROSITY HEAVILY DOPED CONTACT LAYER

ABSTRACT

A high emission electron emitter and a method of fabricating a high emission electron emitter are disclosed. A high emission electron emitter includes an electron injection layer, an active layer of high porosity porous silicon material in contact with the electron injection layer, a contact layer of low porosity porous silicon material in contact with the active layer and including an interface surface with a heavily doped region, and an optional top electrode in contact with the contact layer. The contact layer reduces contact resistance between the active layer and the top electrode and the heavily doped region reduces resistivity of the contact layer thereby increasing electron emission efficiency and stable electron emission from the top electrode.

The electron injection layer is made from an electrically conductive material such as **n+** semiconductor, **n+** single crystal silicon, a metal, a silicide, or a nitride. The active layer and the contact layer are formed in a layer of silicon material that is deposited on the electron injection layer and then electrochemically anodized in a hydrofluoric acid solution. Prior to the anodization, the interface surface can be doped to form the heavily doped region. The layer of silicon material can be porous epitaxial silicon, porous polysilicon, porous amorphous silicon, and porous silicon carbide.